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Consultants dispute studies on Rosemont pit lake

By Dick Kamp
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Two studies conducted on behalf of a Canadian company that wants to mine in the Santa Rita Mountains indicate a pit lake will form in the aftermath, but say it will be non-acidic and non-polluting. Two consultants hired by the Pima County Board of Supervisors, which opposes the mine, disagree.

Augusta Resources commissioned the studies as part of a plan of operations for its proposed Rosemont open-pit copper mine. The plan was submitted to the Coronado National Forest and will be evaluated under the National Environmental Policy Act (NEPA) as the U.S. Forest Service decides whether to approve the project.

In November, Augusta released a report titled "Hydrogeology of the Santa Rita Rosemont Site," analyzing water behavior in the area around the proposed site.

The study, conducted by Montgomery and Associates (M&A), concluded that mining at the site would produce a lake 819 feet deep, and that "dewatering," or pumping out the pit during operations, would drop the water table around it by approximately 2020 feet.

The pit lake will not drain water from the Sonoita Creek watershed, the study said. Instead, it will act as a sink for the surrounding area, catching water and filling up faster than it evaporates.

However, the study's 100-year projections suggest that surface streams close to the pit – and within the Barrel and Davidson canyons' watersheds – could dry out.

In a second February report, consultant Tetra Tech studied rocks around the pit and concluded that the lake would not be acidic, despite the mining of sulfide ore. It predicted that calcium carbonate or limestone would buffer any potential leaching.

This graphic shows a Pima County Flood Control District estimate of current water table at the Rosemont mine site superimposed over the proposed pit. Scale in feet indicates depth of pit. Graphic Courtesy of Pima County

Arizona Department of Environmental Quality (ADEQ) documents show that there has been a non-acidic pit lake at the former Phelps Dodge mine in Ajo. The documents, however, show elevated levels of sulfates in groundwater near the site, raising concern for greater pollution in the coming decades.

Bounds of analysis

In December, Pima County hired geohydrologist Tom Myers to analyze the M&A study and conduct further evaluations. In a letter sent Feb. 1 to Coronado National Forest Superintendent Jeanine Derby, County Administrator Chuck Huckelberry cited Myers' report in saying that Augusta "artificially and unfairly" limited the bounds of analysis.

Myers, author of a Pima County analysis of a 2007 Rosemont analysis of an earlier pit projection, criticized the 100-year limit of the study, saying predictive models must look "many centuries" into the future.

"Our descendants will find that how we care to present our opinions today is irrelevant thousands of years from now," he said.

But Augusta Vice President Jamie Sturgess wrote in an e-mail that 100 years is a "reasonable length of time for determining the extent and nature of effects on the local area," and said University of Arizona experts consider a 40-year model to be a "stretch."

"We are now running the model… to other time periods both shorter and longer than 100 years," Sturgess said. "Periods in the thousands of years as in the county models push the bounds of reality."

Myers says the pit, following closure, will likely create a hydraulic sink – unless it intersects a fault system or fracture zone. "The geology is faulted and unpredictable," he said, noting that if a pit intersects a fault system or fracture, the fault could provide a conduit for water in the pit to flow into the groundwater.

"There is no proof that this won't occur and it is one of the uncertainties that is not addressed by Augusta," Myers said. "They would need to mitigate if it happened, because you could theoretically get contaminants from the pit into surrounding groundwater."

Sturgess said M&A's well tests and examination of flow rates have been extensive. He questioned Myers' methodology and theoretical speculation.

"Myers did his studies with no site visit, no understanding of local geography or geology, no discussion with experts in local hydrology, and no access to the extensive test drilling, test pumping, and water-level monitoring," Sturgess wrote.

The only thing that could cause water to migrate from the pit after closure would be an artificial filling, he said.

Potential for acidity

Geochemist Ann Maest, an expert on water, rocks and pollution, works for Pima County to evaluate portions of the Rosemont site. Maest has not conducted a detailed analysis of the Tetra Tech study, but said she noticed problems in its data and methodology.

"If a 'closed-system' lake that has nowhere to go forms in a pit with acid-generating rock, at least the upper part of the lake could become acidic and increase in acidity over time," Maest said.

If a flow-through lake forms, its water can also become acidic "by interacting with acid-generating material on the pit walls and in the rubble that exist behind the pit walls," she said.

Maest questions Tetra Tech's conclusions as to what will leach from the pit walls.

"Pit blasting leaves rock highly fractured for tens of feet behind the walls," she said. "Tetra Tech assumes that all of the fractured material in and behind the pit walls would have no ore left. There usually is some ore-like material with abundant sulfides in and behind the pit walls."

Sturgess says blasting is carefully controlled to minimize fracturing into the pit walls.

Tetra Tech's reliance on a geochemical test known as the SPLP is also problematic, Maest says, because with that test, material that leaches out of a sample is immediately diluted by 20 times.

A test known as MWMP is 20 times more concentrated and is better suited for arid conditions, she says, noting that the state of Nevada uses the MWMP.

"Tetra Tech ran a limited number of samples using both leach tests, and results for the MWMP were generally higher," Maest said. "However, these higher numbers were not used in the models that predicted metal concentrations and acidity in the pit lake."

The SPLP is the test required by the Arizona Department of Environmental Quality (ADEQ), Sturgess said.

"The Rosemont Copper project is not in Nevada," he said.

Weathered samples

Maest also says Tetra Tech's protocols don't indicate whether it used weathered samples in its leaching tests. Rocks must be weathered for at least a year in order to accurately represent conditions at the mine, she said, since it takes time for the sulfides to weather and form dissolvable metals that can seep into groundwater.

"It's especially important to run tests for longer when there is both lots of neutralizing material and a fair amount of sulfide in the rock, (as is) the case for many Rosemont samples," she said. "We need to know if the neutralizing ability will run out before the acid-generating ability."

According to Sturgess, Tetra Tech's tests averaged 35 weeks and were stopped after researchers determined the leach rates had leveled off.

"Because of the underlying geology of the ore body, there was no acid generation and therefore no reason to continue the leach tests," he said. "The fundamental limestone and sedimentary geology, and the extremely low levels of trace metals or pyrites in the Rosemont deposit (are) favorable for exposure to weathering."

But Maest says that carbonates such as limestone dissolve more rapidly than pyrites, which are the main source of acid drainage. And that can cause problems in the long run.

William Shafer, a geochemical mining consultant who has worked on the Rosemont project, said in an e-mail that he couldn't discuss specifics of the mine due to a potential conflict of interest. But he said he believes the carbonate in the area could buffer the pit lake against acidity.

Even so, Shafer shared Maest's concern over the methodology of the Tetra Tech study, questioning the reliability of the SPLP method, and any tests of un-weathered samples.

Under consideration

ADEQ is currently considering an application from Augusta for an aquifer protection permit (APP) that would regulate discharges from the mine based on surface and groundwater impact.

Michelle Robertson, ADEQ Water Quality Division Groundwater section manager, said in March that it could take six months to issue a draft permit.

"We're evaluating the engineering studies from the perspective of applying the best available technology to prevent water pollution," she said, though she noted that the consideration for an APP is narrower in scope than federal evaluations made under the National Environmental Policy Act.

The Coronado National Forest and the U.S. Forest Service, which will evaluate the Rosemont plan according to the federal guidelines, denied requests to interview its technical staff.

(Dick Kamp is the environmental liaison for Wick Communications.)

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